

Hazard Analysis

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Table 01: Hazard Analysis and Risk Assessment

Hazard ID	Situational Analysis							Hazard Identification						Hazard Event Classification						Determination of ASIL and Safety Goals	
	Operational Mode	Operational Scenario	Environmental Details	Situation Details	Other Details (optional)	Item Usage (function)	Situation Description	Function	Deviation	Deviation Details	Hazardous Event (resulting effect)	Event Details	Hazardous Event Description	Exposure (of situation)	Rationale (for exposition)	Severity (of potential harm)	Rationale (for severity)	Controllability (of hazardous event)	Rationale (for controllability)	ASIL Determination	Safety Goal
HA-001	OM3 Normal driving	OS04 Highway	EN06 Rain (slippery road)	SD02 High speed		IU01 Correctly used	High speed driving on a highway during rain (slippery road)	Lane Departure Warning (LDW) function shall apply an oscillating steering torque to provide the driver with haptic feedback	DV04 Actor effect is too much.	The LDW function applies an oscillating torque with very high torque (above limit).	EV00 Collision with other vehicle.	High haptic feedback can affect driver's ability to steer as intended. The driver could lose control of the vehicle and collide with another vehicle or with road infrastructure.	The LDW function applies too high an oscillating torque to the steering wheel (above limit).	E3 medium probability	Drivering in a highway may happen once a month or more	S3 Severe and life-threatening injuries	High speed travelling on a highway	C3 Difficult to control or uncontrollable	Overreaction of the steering wheel may surprise a driver and cause over-reaction on steering which could lead to an accident	C	The oscillating steering torque from the lane departure warning function shall be limited
HA-002	OM3 Normal driving	OS03 Country Road	EN01 Normal conditions	SD02 High speed		IU02 Incorrectly used	High speed driving on a country road under normal conditions, driver is mis-using the system for autonomous driving	Lane Keeping Assistance (LKA) function shall apply the steering torque when active in order to stay in ego lane	DV03 Function always activated	LKA function is always activated	EV00 Collision with other vehicle	Driver mis-uses the function for autonomous driving, therefore unable to react quickly in critical situations	The LKA function is always activated giving a driver an illusion of autonomous driving.	E2 low probability	Driving on country road with high speed and mis-using the system	S3 Severe and life-threatening injuries	High speed travelling on a country road	C3 Difficult to control or uncontrollable	Driver could take hands off the steering wheel and unable to react quickly when driving with high speed	B	LKA function shall be time limited and the additional steering torque shall end after a given timer interval so that the driver can not misuse the system for autonomous driving.
HA-003	OM3 Normal driving	OS10 Road with construction site	EN01 Normal conditions	SD02 High speed		IU01 Correctly used	High speed driving on a road with construction site, road signs and direction contradict lane lines	Lane Keeping Assistance (LKA) function shall apply the steering torque when active in order to stay in ego lane	DV03 Function always activated	LKA function is not deactivated when lane is not detected	EV-04 Front collision with obstacle	Applied steering torque if lane is detected but no road signs contradict will confuse the driver, and make driving more difficult	Applied torque to steer the car to the lane on a road which undergoes construction may lead to collision with an infrastructure	E3 medium probability	Occurs once a month or more often for an average driver	S3 Severe and life-threatening injuries	May lead to collision with infrastructure	C3 Difficult to control or uncontrollable	Drivering may become more difficult to overcome the functionality of the system	C	LKA function shall be turned off if lane lines and road signs contradict each other
HA-004	OM3 Normal driving	OS04 Highway	EN07 Snow (slippery road)	SD02 High speed		IU01 Correctly used	High speed driving on a winter-road (snow/ice)	Lane Keeping Assistance (LKA) function shall apply the steering torque when active in order to stay in ego lane	DV04 Actor effect is too much	LKA function applies too much torque on a slippery road	EV-02 Side collision with other traffic	Too much steering torque applied may lead to drift and uncontrollable behavior	Too much steering torque applied on a slippery road may lead to drift on a high speed may lead to uncontrollable driving and collision	E2 Low probability	Occurs a few times a year for the great majority of drivers	S3 Severe and life-threatening injuries	May lead to collision with other vehicles or infrastructure	C3 Difficult to control or uncontrollable	Drivering may become more difficult go out of a drift on a slippery road	B	Steering torque from the LKA function shall be limited depending on the environmental conditions and road condition